EXTENSION STRUCTURE FOR TOOL

CROSS-REFERENCES TO RELATED APPLICATIONS

The present invention is a continuation-in-part application of the co-pending U.S. serial No. 10/026,787, filed on December 27, 2001.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an extension structure for a tool such as a wrench or the like, and more particularly to an extension structure which can be assembled easily and quickly and has a rigid construction.

2. Description of the Related Art

The closest prior art reference of which the applicant is aware is disclosed in the Taiwanese Patent Publication No. 88221334, entitled by "Main body of Wrench Extension", which disclosed a wrench extension including a main body, a push ring, and relative push and locking mechanisms. However, the structure of the wrench extension is complicated, and cannot be assembled easily, thereby causing inconvenience in assembly, and thereby increasing cost of fabrication.

Another prior art references are disclosed in the U.S. Patent No. 6,199,457-B1, the U.S. Patent No. 6,267,032-B1, and the U.S. Patent No. 6,523,441-B2.

SUMMARY OF THE INVENTION

The primary objective of the present invention is to provide an extension structure which can be assembled easily and quickly, and has a rigid construction without detachment.

In accordance with the present invention, there is provided an extension structure, comprising:

a main body;

a drive rod movably mounted in the main body;

an elastic member mounted in the main body and urged between the main body and the drive rod; and

a rotation control member rotatably mounted on the main body and rested on the drive rod, so that the drive rod is moved in the main body by rotation of the rotation control member.

Further benefits and advantages of the present invention will become apparent after a careful reading of the detailed description with appropriate reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is an exploded perspective view of an extension structure for a tool in accordance with the preferred embodiment of the present invention;

Fig. 2 is a partially cut-away top plan cross-sectional assembly view of the extension structure as shown in Fig. 1;

Fig. 3 is a front plan cross-sectional assembly view of the extension structure as shown in Fig. 1;

Fig. 4 is a schematic operational view of the extension structure as shown in Fig. 2;

Fig. 5 is a schematic operational view of the extension structure as shown in Fig. 3; and

Fig. 6 is a partially perspective assembly view of the extension structure in accordance with the preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Referring to the drawings and initially to Fig. 1, an extension structure for a tool, such as a wrench or the like, in accordance with the preferred embodiment of the present invention comprises a main body 10, a drive rod 20 movably mounted in the main body 10, an elastic member 30 mounted in the main body 10 and urged between the main body 10 and the drive rod 20, and a rotation control member 4 rotatably mounted on the main body 10 and rested on the drive rod 20, so that the drive rod 20 is moved in the main body 10 by rotation of the rotation control member 4.

The main body 10 has an elongated cylindrical shape and has an inside formed with an elongated receiving chamber 14 extended in an axial direction of the main body 10. The main body 10 has a first end formed with a rectangular locking end 11 and a second end formed with a mounting portion 12. The locking end 11 of the main body 10 has a peripheral wall formed with a ball receiving hole 110 communicating with the receiving chamber 14, and a

locking ball 13 is movably mounted in the ball receiving hole 110. The main body 10 has a mediate portion having a peripheral wall formed with a circular shaft hole 15 communicated with the receiving chamber 14. The shaft hole 15 of the main body 10 is extended into the receiving chamber 14 and has a side formed with a recessed closed wall 150 (see Fig. 3).

The drive rod 20 is movably mounted in the receiving chamber 14 of the main body 10. The drive rod 20 has a first end formed with an arcuate push recess 21 that is movable to align with the ball receiving hole 110 of the main body 10 for receiving the locking ball 13. The drive rod 20 has a second end formed with an operation slot 22 aligning with the shaft hole 15 of the main body 10.

The rotation control member 4 includes a circular rotation body 40 rotatably mounted in the shaft hole 15 of the main body 10, a knob 41 mounted on a first side of the rotation body 40 and protruded outward from the main body 10, a circular drive section 42 mounted on a second side of the rotation body 40 and received in the operation slot 22 of the drive rod 20, and a circular enlarged head 420 mounted on a distal end of the drive section 42 and protruded outward from and rested on a peripheral wall of the drive rod 20. Preferably, the enlarged head 420 of the rotation control member 4 is rotatably mounted in the closed wall 150 of the shaft hole 15 of the main body 10 as shown in Fig. 3. Preferably, the enlarged head 420 of the rotation control member 4 has a diameter greater than that of the drive section 42.

The operation slot 22 of the drive rod 20 has the shape of a keyhole, and has a first end formed with a passage portion 220 having a diameter greater than that of the enlarged head 420 of the rotation control member 4 and a second formed with a positioning portion 221 having a width smaller than the diameter of the passage portion 220 and equal to the diameter of the drive section 42 of the rotation control member 4.

In addition, the rotation body 40 of the rotation control member 4 formed with a recessed oblique guide face 401, and the operation slot 22 of the drive rod 20 has a distal end formed with an oblique guide edge 23 rested on the guide face 401 of the rotation control member 4. Thus, the rotation body 40 of the rotation control member 4 is rotatable between a first position where the guide face 401 of the rotation body 40 is aligned with and rested on the guide edge 23 of the drive rod 20 and a second position where the peripheral wall 404 of the rotation body 40 is aligned with and rested on the guide edge 23 of the drive rod 20 to move the drive rod 20. In such a manner, the drive rod 20 is moved by rotation of the rotation body 40 of the rotation control member 4.

The receiving chamber 14 of the main body 10 has a distal end formed with a closed wall. The elastic member 30 is mounted in the receiving chamber 14 of the main body 10 and is biased between the closed wall of the receiving chamber 14 and the second end of the drive rod 20.

In assembly, referring to Figs. 1-6, the drive rod 20 is pressed to retract into the receiving chamber 14 of the main body 10 to compress the

elastic member 30 until the operation slot 22 of the drive rod 20 aligns with the shaft hole 15 and the passage portion 220 of the operation slot 22 aligns with the enlarged head 420 of the rotation control member 4. Then, the enlarged head 420 of the rotation control member 4 is passed through the shaft hole 15 of the main body 10 and the passage portion 220 of the operation slot 22 and inserted into the recessed closed wall 150 of the shaft hole 15 as shown in Fig. 3. At the same time, the drive section 42 of the rotation control member 4 is extended through the passage portion 220 of the operation slot 22, and the rotation body 40 of the rotation control member 4 is mounted in the shaft hole 15 of the main body 10. Then, the rotation body 40 of the rotation control member 4 is rotated in the shaft hole 15 of the main body 10 until the guide face 401 of the rotation body 40 is aligned with the guide edge 23 of the drive rod 20. At this time, the drive rod 20 is pushed by the elastic member 30 to move outward relative to the main body 10 and the rotation control member 4 until the guide face 401 of the rotation body 40 is rested on the guide edge 23 of the drive rod 20, so that the drive section 42 of the rotation control member 4 is inserted into the positioning portion 221 of the operation slot 22 as shown in Fig. 2 and the enlarged head 420 of the rotation control member 4 is rested on the peripheral wall of the drive rod 20. Thus, the rotation control member 4 and the drive rod 20 are combined with each other integrally and cannot be separated from each other. In addition, the drive section 42 of the rotation control member 4 is slidable in the positioning portion 221 of the operation slot

22 without detachment by restriction of the enlarged head 420 of the rotation control member 4. At the same time, the locking ball 13 is pushed by the push recess 21 of the drive rod 20 to protrude outward from the ball receiving hole 110 of the main body 10 as shown in Fig. 3.

Accordingly, the extension structure for a tool such in accordance with the present invention is assembled easily and quickly, and has a rigid construction without detachment.

In operation, referring to Figs. 1-6, the guide edge 23 of the drive rod 20 is initially rested on the guide face 401 of the rotation body 40, and the locking ball 13 is pushed by the push recess 21 of the drive rod 20 to protrude outward from the ball receiving hole 110 of the main body 10 as shown in Fig. 3. Then, the rotation body 40 of the rotation control member 4 is rotated by the knob 41 to separate the guide edge 23 of the drive rod 20 from the guide face 401 of the rotation body 40, so that the peripheral wall 404 of the rotation body 40 is urged on the guide edge 23 of the drive rod 20 to move the drive rod 20 toward the main body 10 and the rotation control member 4 to compress the elastic member 30. In such a manner, the push recess 21 of the drive rod 20 is moved to align with the ball receiving hole 110 of the main body 10, so that the locking ball 13 is retracted into the push recess 21 of the drive rod 20 and is retracted inward from the ball receiving hole 110 of the main body 10 as shown in Fig. 5. At this time, the drive section 42 of the rotation control member 4 slides in the positioning portion 221 of the operation slot 22 as shown in Fig. 4.

Although the invention has been explained in relation to its preferred embodiment as mentioned above, it is to be understood that many other possible modifications and variations can be made without departing from the scope of the present invention. It is, therefore, contemplated that the appended claim or claims will cover such modifications and variations that fall within the true scope of the invention.